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UPDATING THE TAXONOMY AND DISTRIBUTION OF THE EUROPEAN *OSMODERMA*, AND STRATEGIES FOR THEIR CONSERVATION (Coleoptera, Scarabaeidae, Cetoniinae)

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Introduction

Hermit beetles are a group of flower chafers (Scarabaeidae: subfamily Cetoniinae: tribe Trichiini) of the genus *Osmoderma* LePeletier de Saint-Fargeau & Serville, 1828. They are large scarab beetles (more than 30 mm long) that live in old hollow trees. This genus includes a dozen of species widespread throughout the Palaearctic and the Nearctic Regions (see below for a world checklist of the genus). The geographic distribution and the ecological traits of the European species, jointed together under the name *Osmoderma eremita* sensu lato, have been recently summarized by Ranius & Nillson (1997), Schaffrath (2003a, 2003b), Ranius (2000, 2001), Ranius & Hedin (2001, 2004), and Ranius et al. (2005). These studies, supported by many other surveys conducted at local level, evidenced a strong decline suffered by this taxonomic group throughout its distribution range, and reported the extinction from some countries due to habitat loss and intensive forest management. For this reason, *Osmoderma eremita* s.l. was

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listed as prioritary species in Annex IV of the EU's Habitat Directive (Luce 1995, 1996, 2001; Galante & Verdú 2000; Audisio et al. 2003; Ranius et al. 2005).

As discussed in a series of recent contributions (Sparacio 1994, 2000; Tauzin 1994a, b, 1996, 2000, 2002; Krell 1997; Gusakov 2002; Audisio et al. 2003; Dutto 2003; Ranius et al. 2004, 2005), under the name *O. eremita* are probably included at least two or more distinct species or semi-species, whose taxonomic rank has been matter for strongly controversial interpretations. In fact, some studies (Nüssler 1986; Sparacio 1994, 2000; Tauzin 1994b, 2006; Gusakov 2002; Audisio et al. 2003; Ranius et al. 2004) suggested a morphological distinction of at least two up to five substantially allopatric semi-species, whose actual taxonomic position is difficult to ascertain:

O. eremita Scopoli, 1763 widespread in W Europe, eastwards to Germany and W Slovenia; *O. cristinae* Sparacio, 1994 confined to Sicily; *O. italicum* Sparacio, 2000 occurring in S Italy; *O. lassallei* Baraud & Tauzin, 1991 distributed in Greece and European Turkey; *O. coriarius* De Geer, 1774 *sensu* Gusakov (2002) from E Europe (this taxon hereafter treated under the combination *O. barnabita* Motschulsky, 1845; see below the Commented World Checklist).

However, until very recently, *O. eremita* s.l. was provisionally treated as one species with clear geographic morphological variation and three recognized distinct subspecies (*O. eremita eremita*, *O. eremita lassallei*, and *O. eremita cristinae* (Krell 1997, 2004; Shokhin & Bozadjiev 2003).

The aim of this paper is mainly to update the available information towards a reasonable and objectively supported taxonomic arrangement for the whole complex, mainly based on results of a companion molecular paper (Audisio et al. in press), and on recently checked distributional data. We also provide below a complete summary of both previous and current taxonomic and nomenclatorial interpretations, starting from the present-day official arrangement of the complex (*O. eremita eremita*, *O. eremita lassallei*, and *O. eremita cristinae*: Krell 2004), along with the rationale for the newly introduced taxonomic proposals, partly as a consequence of the molecular results of the above mentioned companion paper. Finally, we discuss how genetic and distributional data available so far could contribute in evaluating more correct strategies for the conservation of these rare and endangered species at European level. Hermit beetles, in fact, represent, especially in lowlands, one of the most important "flagship-species" and "umbrella-species" for the protection of the local saproxylic communities (Ranius 2002a, 2002b, 2002c; Audisio et al. 2003).

Available molecular data

The results of our companion molecular paper (Audisio et al. in press) suggest that the distance and parsimony analyses well support two clusters grouping *O. barnabita* and *O. lassallei* on one side, and *O. eremita*, *O. italicum* and *O. cristinae* on the other side. The average level of genetic divergence between the two identified groups is equal to 0.090 (scored values of the genetic distances ($D_{T\&N}$) among all sampled individuals and taxa computed using the Tamura & Nei (1993) algorithm). The genetic divergence within each cluster is enough to discriminate the majority of the included taxa and to confirm their specific status, with the exception of *O. italicum,* whose divergence with *O. eremita* is equal to 0.035. Mean value scored among taxa within the assemblage clustering *O. barnabita* and *O. lassallei* is equal to 0.054. These figures are comparable with values recently scored in other scarab beetles (Coleoptera, Scarabaeidae) for taxa currently interpreted as related but separated species (Villalba et al. 2002; Micó et al. 2003; Cabrero-Sañudo & Zardoya 2004; Tassi et al. 2004), or well distinct sub-species (Carisio et al. 2004). On the other hand, values scored within the group clustering *O. eremita*, *O. italicum* and *O. cristinae* range from 0.035 to 0.047. The lower bound value outlines a more strict degree of genetic relatedness between *O. eremita* and *O. italicum*, suggesting a possible interpretation of the latter as a subspecies or only significant geographic form of the widespread *O. eremita* s.s. On the contrary, the higher values of genetic divergence between *O. cristinae* and both *O. eremita* or *O. italicum*, seem to better support a specific status for the Sicilian group of populations, in congruence with its isolated geographic range (fig. 1).

Zoogeography and distribution

The main taxonomic and zoogeographic conclusions of our companion molecular paper (Audisio et al., in press) are summarised as follows.

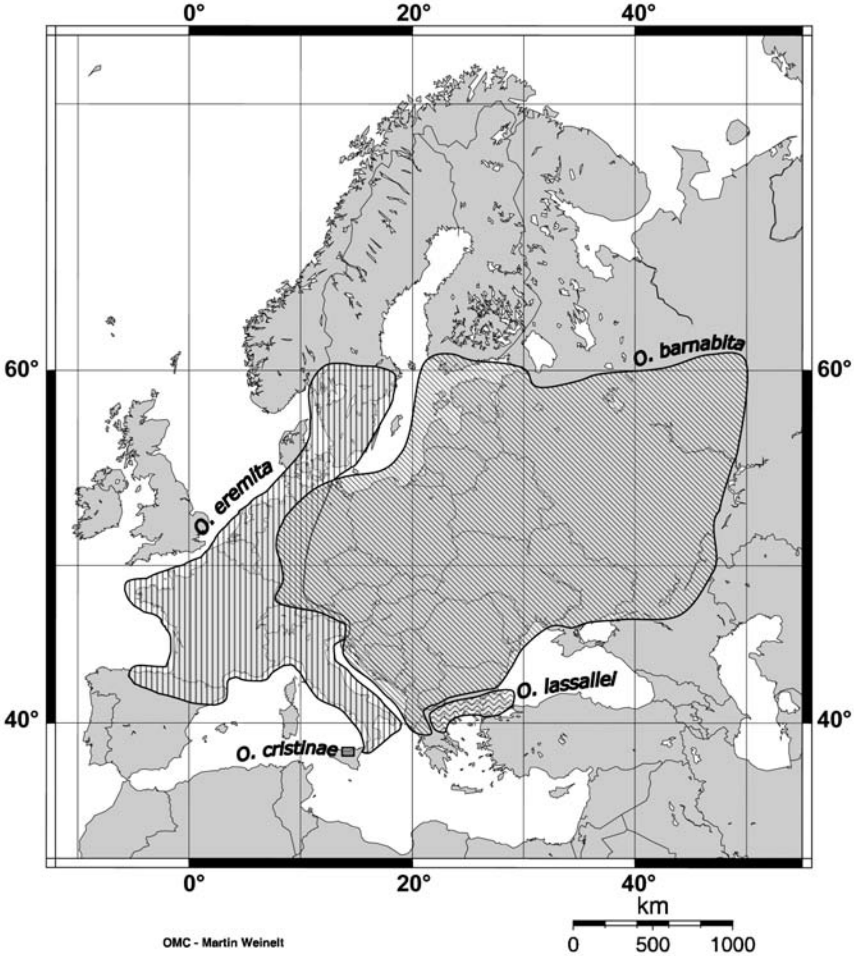

Fig. 1 – Geographical ranges of the *Osmoderma eremita* complex in Europe.

The *Osmoderma eremita* complex includes in Europe at least two distinct clades. The first one (*O. eremita* s.l.), comprises taxa distributed in western Europe (fig. 1: northern Spain, France, Belgium, the Netherlands, Denmark, southern Sweden, southern Norway, Italy, Switzerland, western Austria, western Slovenia, most of western and northern Germany). The second clade (*O. barnabita* s.l.), includes taxa distributed in central and eastern Europe (fig. 1: most of Germany, eastern Austria, Slovenia, Czech Republic, Poland, Hungary, Rumania, Bulgaria, Ukraine, Belarus, Latvia, Lithuania, Estonia, southern Finland, European Russia, Slovakia, Croatia, Bosnia and Herzegovina, Albania, Serbia, Montenegro, Macedonia, Greece, European Turkey) (Sparacio 2000; Gusakov 2002; Ranius et al. 2005; Tauzin 2006; M. Dutto & P. Audisio unpublished data).

Within the *O. eremita* s.l. clade, the taxonomic rank to be attributed to *O. italicum* and to *O. cristinae* is still questionable, both taxa probably being at the border line between recently separated allopatric species and semispecies. For the reasons discussed above, we prefer here provisionally to treat at least *O. cristinae* as separated species (fig. 1). As to *O. italicum*, despite the rather significant genetic divergence of the single examined specimen (OI1.1), we choose here to tentatively consider it only as a possible ESU (Evolutionary Significant Unit in the sense recently proposed by Ryder 1986, and by Moritz 1994, 1995), closely related to the widespread *O. eremita* s.s. Additional genetic data on Italian hermit beetles ("*O. italicum*" and *O. eremita* s.s.) and a more detailed information on their geographical distribution in southern Italy are needed, chiefly in the areas between southern Latium, Molise and Campania.

Within the *O. barnabita* s.l. clade, the taxonomic rank to be attributed to *O. lassallei* seems to be less questionable, due to the evidence of nearly parapatric occurrence of both *O. barnabita* s.s. and O. *lassallei* in NW and NE Greece, respectively (fig. 1), with a relatively high degree of genetic differentiation.

As widely discussed by Audisio et al. (in press), under a first assumption of a mtDNA mutation rate of only 1.2% per million years, the divergence time estimated between *Osmoderma barnabita* s.l. (= *O. barnabita* + *O. lassallei*) and *O. eremita* s.l. (= *O. eremita* + *O. cristinae* + *O. italicum*) is more than 6 million years, and around 3-4 m.y. among taxa included in each clade. Under the second assumption of a mtDNA mutation rate of 2% per million years, the divergence time estimated between *Osmoderma barnabita* s.l. (= *O. barnabita* + *O. lassallei*) and *O. eremita* s.l. (= *O. eremita* + *O. cristinae* + *O. italicum*) is more than 4-5 million years (Pliocene), and around 2 m.y. (Pleistocene) among taxa included in each clade. Therefore, in both cases the suggested evolutionary scenario implies that the divergence of *Osmoderma* populations (following the geographic isolation of mesophilous woodlands) likely predated most of the late Pleistocene glaciations. However, the climatic cooling probably confined *Osmoderma* populations for several times to some scattered refuge areas of the Balkan and Italian peninsulas, and Sicily, causing further fragmentation of their genetic pools into more or less isolated groups. In this way the ancestral European *Osmoderma* may have been scattered in isolated southern refugia for many thousands of years during the Ice Ages and then expanded northwards following climate amelioration (Taberlet et al. 1998; Hewitt 1999; Vogel et al. 1999).

The rarity of most hermit beetle taxa and the associated legal limitations in collecting specimens are a serious and obvious drawback for taxonomic research on this genus. In fact, genetic data on hermit beetles should be increased both in terms of sampled specimens and examined populations, in order to assess the specific or subspecific rank of all the taxa assigned to *Osmoderma*. The divergence levels between European species, assessed by our researches, should be calibrated with data gathered from closely related but neatly distinct taxa (e.g., species of the related genus *Gnorimus* LePeletier de Saint-Fargeau & Serville, 1828, or less closely related *Osmoderma* species from the Caucasus, the Palaearctic Far East or the Nearctic Region; see Check List).

Given the taxonomical and zoogeographical scenario here reported, and summarised in fig. 1, we strongly support the need to enhance the efforts of the European entomologists, in order to quickly achieve more detailed data on the actual geographic distribution and genetic variation of *Osmoderma* spp. in Europe, with special reference to those countries where two or more species are actually (or potentially) present. As showed in fig. 1, the focal points of these researches should be represented by the following areas:

Germany, eastern Switzerland, western Austria, and Slovenia, where *Osmoderma eremita* s.s. and *O. barnabita* s.s. are locally parapatric or even sympatric (see also Tauzin 1994b, Sparacio 2000, Gusakov 2002, Dutto 2003, and unpublished data; fig. 1);

central-southern Italy, where *O. eremita* s.s. and "*O. italicum*" could be in contact;

northern Greece, Albania, Macedonia, southern Serbia, southern Bulgaria, and European Turkey, where the actual detailed distribution of *O. barnabita* s.s. and *O. lassallei* should be more accurately analysed.

Osmoderma LePeletier de Saint-Fargeau & Serville, 1828

Gymnodi Kirby, 1827: 157
Osmoderma LePeletier de Saint-Fargeau & Serville, 1828: 702
Gymnodus Kirby, 1837: 139
Osmodermum Burmeister & Schaum, 1840: 364

NOTE: We maintain here the traditional generic name *Osmoderma* instead of the recently re-introduced name *Gymnodus* Kirby, 1827 (Ádám 1994, 2003; Gusakov 2002), according to a submitted proposal to the ICZN (Krell et al. 2006) to place the former one on the Official List of Generic Names in Zoology and to suppress the generic name *Gymnodus* for the purposes of the Principle of Priority but not for those of the Principle of Homonymy (Krell et al. 2006; Barclay 2007; International Commission of Zoological Nomenclature, 2007; Audisio et al. in press).

TYPE SPECIES: *Scarabaeus eremita* Scopoli, 1763 (subsequent designation by MacLeay 1838 , p. 16).

THE *OSMODERMA EREMITA* GROUP Western Europe (fig. 1)

Osmoderma eremita (Scopoli, 1763)

Scarabaeus variabilis Linné, 1758: 352 (nec *Scarabaeus variabilis* Linné, 1758: 353)
Scarabaeus eremita Scopoli, 1763: 7 (*)
Scarabaeus coriarius De Geer, 1774: 300
Trichius eremita Fabricius, 1775: 45
Cetonia eremitica Knoch, 1801: 107
? *Osmoderma sociale* Horn, 1871:338
Osmoderma eremita var. *Semirufum* Pic, 1915: 363
Osmoderma eremitum: Tauzin, 1994b: 224
Osmoderma eremita eremita: Krell, 1997: 226
Osmoderma italica Sparacio, 2000: 232 (**)
Osmoderma italicum: Audisio et al., 2003: 58 (**); Pignaturo & Vicidomini, 2007
Gymnodus eremita: Gusakov, 2002: 12

NOTES: (*) the neotype of *Osmoderma eremita* (Scopoli, 1763) was recently redesignated by Dutto (2003, 2005) on a male specimen from Slovenia, Kranj; in fact, the first neotype designation by Tauzin (1994b: 228) on a male specimen from Italy, Florence, was manifestly invalid (Massa 1995; Audisio et al. 2003; Dutto 2003).

(**) The interpretation of *Osmoderma italicum* from southern Italy as potentially distinct species, semispecies or at least Evolutionary Significant Unit (ESU: Moritz 1994) is to be still considered highly questionable, pending for more detailed distributional and molecular data on this extremely rare taxon.

Osmoderma cristinae Sparacio, 1994 Northern Sicily (fig. 1)

Osmoderma cristinae Sparacio, 1994: 306; Brustel, 2004: 204
Osmoderma eremitum meridionale Tauzin, 1994b: 228; Massa, 1995: 307
Osmoderma eremita cristinae: Krell, 1997: 226
Gymnodus cristinae: Gusakov, 2002: 12

Osmoderma barnabita Motschulsky, 1845
E Europe, W Russia (fig. 1)

Osmoderma barnabita Motschulsky, 1845: 58 (nec *O. barnabita* sensu Motschulsky, 1860: 134, nec auct.); Tauzin, 2006: 40.
Osmoderma lassallei septentrionale Tauzin, 1994b: 223
Gymnodus eremita: Ádám, 1994: 10
Osmoderma eremita lassallei: Krell, 1997: 226, partim
Gymnodus coriarius: Gusakov, 2002: 16, nec ? (De Geer, 1774): 300

NOTE: the lectotype of *Osmoderma barnabita* Motschulsky, 1845 was recently designated by Gusakov (2002: 16) on a female specimen from Central Russia, certainly conspecific with the central-eastern European populations of the *Osmoderma eremita* complex previously attributed to *O. eremita* (Ádám 1994), *O. lassallei septentrionale* (Tauzin 1994b), *O. eremita* ssp. *lassallei* (Krell 1997, partim) or to *O. lassallei* s.l. (Sparacio 2000, partim). The use of a junior synonym of *O. eremita*, *Scarabaeus coriarius* De Geer (1774), recently exhumed by Gusakov (2002) as valid name for *Osmoderma barnabita*, is to be considered as strongly unadvisable, due to the problems of uncertain specific attribution of the so far not available type specimen of this taxon. Gusakov (2002: 25) refers that '*As a name for the "eastern" form* [of *O. eremita* s.l.] *I am suggesting* Scarabaeus coriarius *De Geer, 1774 - as new combination* G. coriarius *(De Geer, 1774). I had no an opportunity to study type specimens of* G. coriarius *and in the primary description there are not mentioned characters important for resolving "western" and "eastern" forms. But I consider it unlikely, that the Swedish* *naturalist De Geer had material from distributional area of the "eastern" form'*.

In fact, De Geer was in contact especially with entomologists from France, Germany, Denmark, and obviously Sweden, all countries being well within the range of the "western form" of *O. eremita*. Then, *Scarabaeus coriarius* De Geer, 1774, described from an unknown European locality (De Geer, 1774: 300; he literally reported "*C'est un grand Scarabé des plus rares, et que je n'ai point trouvé à Leufsta* [= Lovstabruk, near Üppsala], *l'ayant eu d'un de mes amis, et je doute même qu'on le rencontre en Suede*"), according to our opinion should much more likely be a synonym of *O. eremita* than of *O. barnabita*. We choose then to consider *O. coriarium* a likely junior synonym of *O. eremita*, resurrecting *Osmoderma barnabita* Motschulsky, 1845 (**resurrected name**), as being the valid and certainly applicable specific epithet for the "oriental form" of *O. eremita* s.l.

Osmoderma lassallei Baraud & Tauzin, 1991
NE Greece, European Turkey (fig. 1)

Osmoderma lassallei Baraud & Tauzin, 1991: 159 et auct., partim; Brustel, 2004: 204
Osmoderma lassallei lassallei: Tauzin, 1994b: 223
Osmoderma eremita lassallei: Krell, 1997: 226, partim
Gymnodus coriarius lassallei: Gusakov, 2002: 12

Osmoderma davidis Fairmaire, 1887 Russian Far East, NE China

Osmoderma Davidis Fairmaire, 1887: 221
Osmoderma barnabita: Motschulsky, 1860: 134, et auct., partim, nec Motschulsky, 1845: 58
Osmoderma barnabitum: Tauzin, 1994a: 202
Osmoderma davidi (sic !): Tauzin, 1994a: 202
Gymnodus davidis: Gusakov, 2002: 35
Gymnodus davidis forma *amurensis* Gusakov, 2002: 39

Osmoderma opicum Lewis, 1887 Japan (Honshu Island)

Osmoderma opica Lewis, 1887: 47
Osmoderma opicum: Tauzin, 1994b: 217
Gymnodus opicus: Gusakov, 2002: 42.

Osmoderma caeleste (Gusakov, 2002)

Russian Far East, N Korea, NE China

Osmoderma barnabitum var. *castaneum* Tauzin, 1994: 204; Tauzin, 2006: 39
Gymnodus caelestis Gusakov, 2002: 39
Osmoderma barnabita auct., partim, nec Motschulsky, 1845: 58
Osmoderma sikhotense Boucher, 2002: 426**;** Boucher et al., 2003: 401; Tauzin, 2006: 43.

NOTE: the official publication date (26.viii.2002) of the Gusakov's monograph where *Gymnodus caelestis* was described (Gusakov 2002) precedes the description of *Osmoderma sikhotense* Boucher, 2002 (published at the end of 2002), despite some doubts still remain on the name having actual priority (Tauzin 2006). The first published name of this taxon appeared under the combination *Osmoderma barnabitum* var. *castaneum* Tauzin, 1994. But, according to the ICZN, an infrasubspecific name published after 1960 and expressly considered a "variety" in its original description, cannot be made available from its original publication by any subsequent action (such as "elevation in rank": Art. 45.5), as correctly discussed by Tauzin (2006).

Osmoderma scabrum (Palisot de Beauvois, 1807)

NE North America

Trichius scaber Palisot de Beauvois, 1807: 58
Osmoderma scaber: Gory & Percheron, 1833: 47
Trichius (Gymnodus) foveatus Kirby, 1837: 140
Trichius (Gymnodus) rugosus Kirby, 1837: 140
Osmoderma scabrum var. *beauvoisii* Bainbridge, 1841: 481
Osmoderma scabrum: Burmeister & Schaum, 1840: 384; Bedel, 1906: 254; Tauzin, 1994a: 198
Osmoderma scabra rugosa: Casey, 1915: 373
Osmoderma scabra gracilipes Casey, 1915: 374
Osmoderma caviceps Casey, 1915: 374
Osmoderma caviceps lacustrina Casey, 1915: 374
Osmoderma scabrum Caseyi Shenkling, 1922: 9
Osmoderma scabra: Howden, 1968: 8
Gymnodus scaber: Gusakov, 2002: 13

THE *OSMODERMA BREVIPENNE* GROUP

Osmoderma brevipenne Pic, 1904 Asiatic Turkey

Osmoderma brevipennis Pic, 1904: 74
Osmoderma brevipenne: Bedel, 1906: 30; Tauzin, 1994a: 208
Gymnodus brevipennis: Gusakov, 2002: 13

Osmoderma richteri Medvedev, 1953 Georgian Caucasus

Osmoderma richteri Medvedev, 1953: 297; 1960: 385; Tauzin, 1994a: 212
Gymnodus richteri: Gusakov, 2002: 32

THE *OSMODERMA EREMICOLA* GROUP

Osmoderma eremicola (Knoch, 1801) NE North America

Cetonia eremicola Knoch, 1801: 105
Osmoderma eremicola: Gory & Percheron, 1833: 47; Howden, 1968: 9; Tauzin, 1994a: 198
Trichius (Gymnodus) drakii Kirby, 1837: 155
Gymnodus eremicola: Gusakov, 2002: 13

Osmoderma subplanatum Casey, 1915 Central North America

Osmoderma eremicola subplanata Casey, 1915: 376; Hoffmann, 1939: 521; Tauzin, 1994a: 205
Osmoderma montana Wickham, 1920: 233; Hoffmann, 1939: 521
Osmoderma subplanata: Howden, 1968: 11; Smith, 2003: 73
Gymnodus eremicola subplanatus: Gusakov, 2002: 13

NOTE: we examined some specimens and agree with R.H. Howden (1968) and Smith (2003) in considering this taxon as a valid species and not a subspecies of *O. eremicola* as proposed by Gusakov (2002), or even a simple synonym as proposed by Hoffmann (1939) and Tauzin (1994a). However it seems that the problem of the taxonomic arrangement of the pair *O. eremicola* and *O. subplanatum* is partly analogous to that observed for some species pairs within the *O. eremita* complex, and it is likely that only molecular analyses could soon provide more insights on the whole matter.

In order to set up and develop successful conservation strategies, it is advisable to combine the diagnostic morphological characters listed and figured by Tauzin (1994b), Sparacio (2000) and Gusakov (2002) with short diagnostic nucleotide sequences, allowing to discriminate among the five taxa here discussed, especially to identify individuals inhabiting the areas of parapatry and sympatry among them. We have in progress a study aimed to summarize morphological and molecular characters to distinguish the different European taxa of the *Osmoderma eremita* species-complex, in order to provide useful data for planning conservation efforts. In fact, the taxonomic changes caused by the splitting of some widespread species into a higher number of them, each with a smaller distribution range, compel conservation biologists to a new assessment of threat level for all the taxonomic group (Ryder 1986). An urgent re-evaluation of threat categories is required for each taxonomic unit derived from any splitting decision, either because of the reduced size of its geographic range or the consequent reduction of its population consistency (Mace & Lande 1991; AA.VV. 1994). Each derived taxonomic unit should be carefully examined in order to apply the major criteria for assessing the risk of extinction, such as (1) Extent of Occurrence, (2) Area of Occupancy, (3) Population Consistency (Mace & Lande 1991). For the same reason, the process of setting priorities for conservation action should also be rebuilt after the evaluation of the different factors which affect the risk of extinction for each taxonomic unit.

In the case of *Osmoderma* species and/or semispecies, as defined by the present paper, the small size of geographic range (extent of occurrence) for *O. cristinae* and *O. lassallei* let us to consider them as the most threatened taxa of the complex. Probably, they should also be placed among the most threatened animal species of southern Europe, considering their restricted area of occupancy (mainly that of *O. cristinae*), associated with a potentially fatal combination of limited population size, reduced habitat availability, bird predation, fires, and frequently unsuitable local techniques of forest management. The population size of these two taxa should be accurately estimated and monitored, at least in the Sites of Community Importance established according to the EU Habitat Directive.

It must be also considered that the taxa recently separated at specific level from the former "*Osmoderma eremita*" risk now to have no legal protection in the next few years, as recently discussed by Brustel (2004). In fact, if considered as being a distinct species, their legal protection should be formally no longer active under the "umbrella" of the binomial combination "*Osmoderma eremita*" regulated by the EU Habitat Directive, 1992. Happily, the new coming Italian Coleoptera Red List (Various Authors in progress) should soon provide the necessary legal protection at least to *O. cristinae* in Sicily.

Our studies show that there is clear evidence of genetically divergent European species and semi-species within the *Osmoderma eremita* complex. It is rather high the risk that at least part of this genetic diversity could be eroded in the next future, and these preliminary data may be key to the conservation of the hermit beetles in Europe. The whole problem should be considered as an international concern, to be managed with different criteria in each single area.

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SUMMARY

Results of a molecular analysis on the European hermit beetles (the *Osmoderma eremita* species-complex), recently published in a companion paper, are shortly discussed and commented. These results indicate a clear-cut distinction between two clades. The first one includes the W-European *O. eremita* Scopoli, 1763, and the two Italian endemic taxa *O. italicum* Sparacio, 2000 and *O. cristinae* Sparacio, 1994, from southern peninsular Italy and Sicily, respectively. The second one includes the widespread E-European *O. barnabita* Motschulsky, 1845 (**nom. resurr.**), and the southern Balcanic *O. lassallei* Baraud & Tauzin, 1991 from Greece and European Turkey. Within the two clades, molecular data well support a specific rank for *O. lassallei* and *O. barnabita* on one side, and of *O. eremita* and *O. cristinae* on the other side, while the taxo-

nomic position of *O. italicum*, more closely related with *O. eremita*, is still uncertain, waiting for analysis of additional specimens of this very rare taxon. Current geographical distribution, interspecific genetic diversification, and relatively low levels of intraspecific genetic divergence in *O. eremita* sensu stricto, are hypothesized to be the result of multiple speciation events (mainly occurred in refugial forest areas of the Italian and Balkan peninsulas and Sicily before and during the Pleistocene glacial peaks), followed by fast post-glacial northward and westward expansion of some species. The need of further genetic data on the rare and threatened hermit beetle species and the importance of more detailed information on their distribution ranges are emphasized and discussed, in order to plan conservation strategies in the near future. An updated worldwide checklist of the species of the genus *Osmoderma* is finally presented.

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